

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
 US Department of Commerce
 United States Patent and Trademark
 Office, PCT
 2011 South Clark Place Room
 CP2/5C24
 Arlington, VA 22202
 ETATS-UNIS D'AMERIQUE
 in its capacity as elected Office

Date of mailing (day/month/year) 08 May 2001 (08.05.01)	
International application No. PCT/SE00/01559	Applicant's or agent's file reference 1917/2290
International filing date (day/month/year) 09 August 2000 (09.08.00)	Priority date (day/month/year) 06 September 1999 (06.09.99)
Applicant NORDVALL, Per	

1. The designated Office is hereby notified of its election made:



in the demand filed with the International Preliminary Examining Authority on:

07 March 2001 (07.03.01)



in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was

was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Claudio Borton Telephone No.: (41-22) 338.83.38
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REC'D 30 AUG 2001

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 1917/2290	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/SE00/01559	International filing date (day/month/year) 09.08.2000	Priority date (day/month/year) 06.09.1999
International Patent Classification (IPC) or national classification and IPC B21D 19/08 // B21D 5/02		
Applicant STRÖMSHOLMEN AB et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 3 sheets, including this cover sheet.
- ☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of _____ sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 07.03.2001	Date of completion of this report 22.08.2001
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. 08-667 72 88	Authorized officer Anders Brinkman/MP Telephone No. 08-782 25 00

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/SE00/01559

I. Basis of the report

1. With regard to the elements of the international application:*

- ☒ the international application as originally filed
- ☐ the description:
 pages _____, as originally filed
 pages _____, filed with the demand
 pages _____, filed with the letter of _____
- ☐ the claims:
 pages _____, as originally filed
 pages _____, as amended (together with any statement) under article 19
 pages _____, filed with the demand
 pages _____, filed with the letter of _____
- ☐ the drawings:
 pages _____, as originally filed
 pages _____, filed with the demand
 pages _____, filed with the letter of _____
- ☐ the sequence listing part of the description:
 pages _____, as originally filed
 pages _____, filed with the demand
 pages _____, filed with the letter of _____

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language English which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☒ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheet/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2 (c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

** Any replacement sheet containing such amendments must be referred to under item I and annexed to this report.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/SE00/01559

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	<u>1-10</u>	YES
	Claims		NO
Inventive step (IS)	Claims	<u>1-10</u>	YES
	Claims		NO
Industrial applicability (IA)	Claims	<u>1-10</u>	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

The documents cited in the International Search Report represent the prior art. The claimed invention stated in claims 1-10 is not considered to be anticipated by these documents. None of the documents or any relevant combination of them reveal a device as described by these claims.

According to the arguments stated above, the invention claimed in claims 1-10 is novel, considered to involve an inventive step and has industrial applicability.

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PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No. **PCT/SE 00 / 0 1 5 5 9**

International Filing Date **0 9 -08- 2000**

Name of receiving Office and "PCT International Application"
The Swedish Patent Office
PCT International Application

Applicant's or agent's file reference
(if desired) (12 characters maximum) **1917/2290**

Box No. I TITLE OF INVENTION	
Device at a plate forming tool	
Box No. II APPLICANT	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)	
STRÖMSHOLMEN AB Box 216 S-573 23 TRANÅS Sweden	<input type="checkbox"/> This person is also inventor. Telephone No. Facsimile No. Teleprinter No.
State (that is, country) of nationality: SE	State (that is, country) of residence: SE
This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input checked="" type="checkbox"/> all designated States except the United States of America <input type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box	
Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)	
NORDVALL, Per Hagadalsgatan 57 S-573 40 TRANÅS Sweden	This person is: <input type="checkbox"/> applicant only <input checked="" type="checkbox"/> applicant and inventor <input type="checkbox"/> inventor only (If this check-box is marked, do not fill in below.)
State (that is, country) of nationality: SE	State (that is, country) of residence: SE
This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input checked="" type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box	
<input type="checkbox"/> Further applicants and/or (further) inventors are indicated on a continuation sheet.	
Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE	
The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: <input checked="" type="checkbox"/> agent <input type="checkbox"/> common representative	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)	
Each of: WILLQUIST, Bo/ WILLQUIST, Ulf JOHANNESSON, Eva Willquist & Partners Patentbyrå AB Platensgatan 9C S-582 20 LINKÖPING Sweden	Telephone No. +46-13246300 Facsimile No. +46-13143398 Teleprinter No.
<input type="checkbox"/> Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.	

Box No.V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes; at least one must be marked):

Regional Patent

- ☒ AP ARIPO Patent: GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, MZ Mozambique, SD Sudan, SL Sierra Leone, SZ Swaziland, TZ United Republic of Tanzania, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☒ EA Eurasian Patent: AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ EP European Patent: AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☒ OA OAPI Patent: BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, GW Guinea-Bissau, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line)

National Patent (if other kind of protection or treatment desired, specify on dotted line):

- | | |
|--|--|
| <input checked="" type="checkbox"/> AE United Arab Emirates | <input checked="" type="checkbox"/> LC Saint Lucia |
| <input checked="" type="checkbox"/> AG Antigua and Barbuda | <input checked="" type="checkbox"/> LK Sri Lanka |
| <input checked="" type="checkbox"/> AL Albania | <input checked="" type="checkbox"/> LR Liberia |
| <input checked="" type="checkbox"/> AM Armenia | <input checked="" type="checkbox"/> LS Lesotho |
| <input checked="" type="checkbox"/> AT Austria | <input checked="" type="checkbox"/> LT Lithuania |
| <input checked="" type="checkbox"/> AU Australia | <input checked="" type="checkbox"/> LU Luxembourg |
| <input checked="" type="checkbox"/> AZ Azerbaijan | <input checked="" type="checkbox"/> LV Latvia |
| <input checked="" type="checkbox"/> BA Bosnia and Herzegovina | <input checked="" type="checkbox"/> MA Morocco |
| <input checked="" type="checkbox"/> BB Barbados | <input checked="" type="checkbox"/> MD Republic of Moldova |
| <input checked="" type="checkbox"/> BG Bulgaria | <input checked="" type="checkbox"/> MG Madagascar |
| <input checked="" type="checkbox"/> BR Brazil | <input checked="" type="checkbox"/> MK The former Yugoslav Republic of Macedonia |
| <input checked="" type="checkbox"/> BY Belarus | <input checked="" type="checkbox"/> MN Mongolia |
| <input checked="" type="checkbox"/> BZ Belize | <input checked="" type="checkbox"/> MW Malawi |
| <input checked="" type="checkbox"/> CA Canada | <input checked="" type="checkbox"/> MX Mexico |
| <input checked="" type="checkbox"/> CH and LI Switzerland and Liechtenstein | <input checked="" type="checkbox"/> MZ Mozambique |
| <input checked="" type="checkbox"/> CN China | <input checked="" type="checkbox"/> NO Norway |
| <input checked="" type="checkbox"/> CR Costa Rica | <input checked="" type="checkbox"/> NZ New Zealand |
| <input checked="" type="checkbox"/> CU Cuba | <input checked="" type="checkbox"/> PL Poland |
| <input checked="" type="checkbox"/> CZ Czech Republic | <input checked="" type="checkbox"/> PT Portugal |
| <input checked="" type="checkbox"/> DE Germany | <input checked="" type="checkbox"/> RO Romania |
| <input checked="" type="checkbox"/> DK Denmark | <input checked="" type="checkbox"/> RU Russian Federation |
| <input checked="" type="checkbox"/> DM Dominica | <input checked="" type="checkbox"/> SD Sudan |
| <input checked="" type="checkbox"/> DZ Algeria | <input checked="" type="checkbox"/> SE Sweden |
| <input checked="" type="checkbox"/> EE Estonia | <input checked="" type="checkbox"/> SG Singapore |
| <input checked="" type="checkbox"/> ES Spain | <input checked="" type="checkbox"/> SI Slovenia |
| <input checked="" type="checkbox"/> FI Finland | <input checked="" type="checkbox"/> SK Slovakia |
| <input checked="" type="checkbox"/> GB United Kingdom | <input checked="" type="checkbox"/> SL Sierra Leone |
| <input checked="" type="checkbox"/> GD Grenada | <input checked="" type="checkbox"/> TJ Tajikistan |
| <input checked="" type="checkbox"/> GE Georgia | <input checked="" type="checkbox"/> TM Turkmenistan |
| <input checked="" type="checkbox"/> GH Ghana | <input checked="" type="checkbox"/> TR Turkey |
| <input checked="" type="checkbox"/> GM Gambia | <input checked="" type="checkbox"/> TT Trinidad and Tobago |
| <input checked="" type="checkbox"/> HR Croatia | <input checked="" type="checkbox"/> TZ United Republic of Tanzania |
| <input checked="" type="checkbox"/> HU Hungary | <input checked="" type="checkbox"/> UA Ukraine |
| <input checked="" type="checkbox"/> ID Indonesia | <input checked="" type="checkbox"/> UG Uganda |
| <input checked="" type="checkbox"/> IL Israel | <input checked="" type="checkbox"/> US United States of America |
| <input checked="" type="checkbox"/> IN India | <input checked="" type="checkbox"/> UZ Uzbekistan |
| <input checked="" type="checkbox"/> IS Iceland | <input checked="" type="checkbox"/> VN Viet Nam |
| <input checked="" type="checkbox"/> JP Japan | <input checked="" type="checkbox"/> YU Yugoslavia |
| <input checked="" type="checkbox"/> KE Kenya | <input checked="" type="checkbox"/> ZA South Africa |
| <input checked="" type="checkbox"/> KG Kyrgyzstan | <input checked="" type="checkbox"/> ZW Zimbabwe |
| <input checked="" type="checkbox"/> KP Democratic People's Republic of Korea | |
| <input checked="" type="checkbox"/> KR Republic of Korea | |
| <input checked="" type="checkbox"/> KZ Kazakhstan | |

Check-box reserved for designating States which have become party to the PCT after issuance of this sheet:

☐

Precautionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation (including fees) must reach the receiving Office within the 15-month time limit.)

-08- 2000

Sheet No. 3/3

Box No. VI PRIORITY CLAIM		<input type="checkbox"/> Further priority claims are indicated in the Supplemental Box.		
Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country	regional application:* regional Office	international application: receiving Office
item (1) 06.09.99 06 September 1999	9903143-7	Sweden		
item (2)				
item (3)				

☒ The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office) identified above as item(s): 9903143-7

* Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA) (if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used): ISA/ SE

Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority):

Date (day/month/year) 06-09-2000 Number SE 99/01164 Country (or regional Office) SE

Ref SE

Box No. VIII CHECK LIST; LANGUAGE OF FILING

This international application contains the following number of sheets: request : 3 ✓ description (excluding sequence listing part) : 4 ✓ claims : 2 ✓ abstract : 1 ✓ drawings : 5 ✓ sequence listing part of description : Total number of sheets : 15 ✓	This international application is accompanied by the item(s) marked below: 1. <input type="checkbox"/> fee calculation sheet 2. <input type="checkbox"/> separate signed power of attorney 3. <input type="checkbox"/> copy of general power of attorney; reference number, if any: 4. <input type="checkbox"/> statement explaining lack of signature 5. <input type="checkbox"/> priority document(s) identified in Box No. VI as item(s): 6. <input type="checkbox"/> translation of international application into (language): 7. <input type="checkbox"/> separate indications concerning deposited microorganism or other biological material 8. <input type="checkbox"/> nucleotide and/or amino acid sequence listing in computer readable form 9. <input checked="" type="checkbox"/> other (specify): <u>Copy of Int. Search Report</u>
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Figure of the drawings which should accompany the abstract: 1 Language of filing of the international application: Swedish

Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

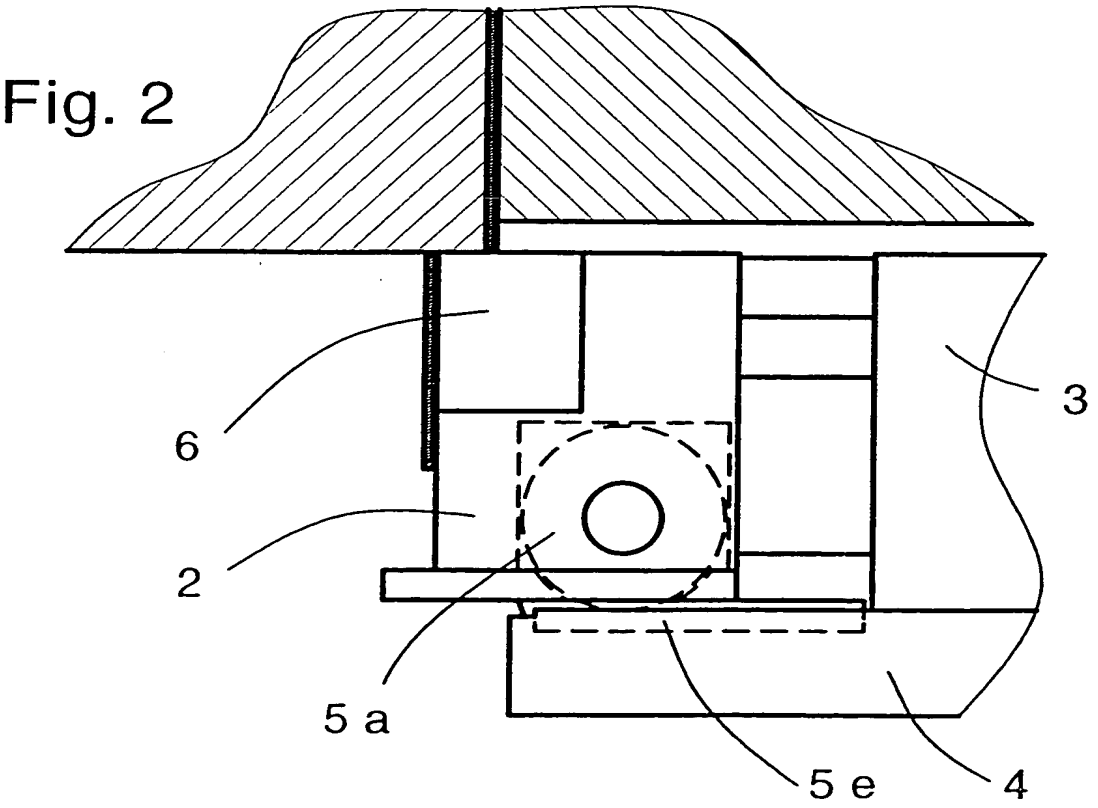
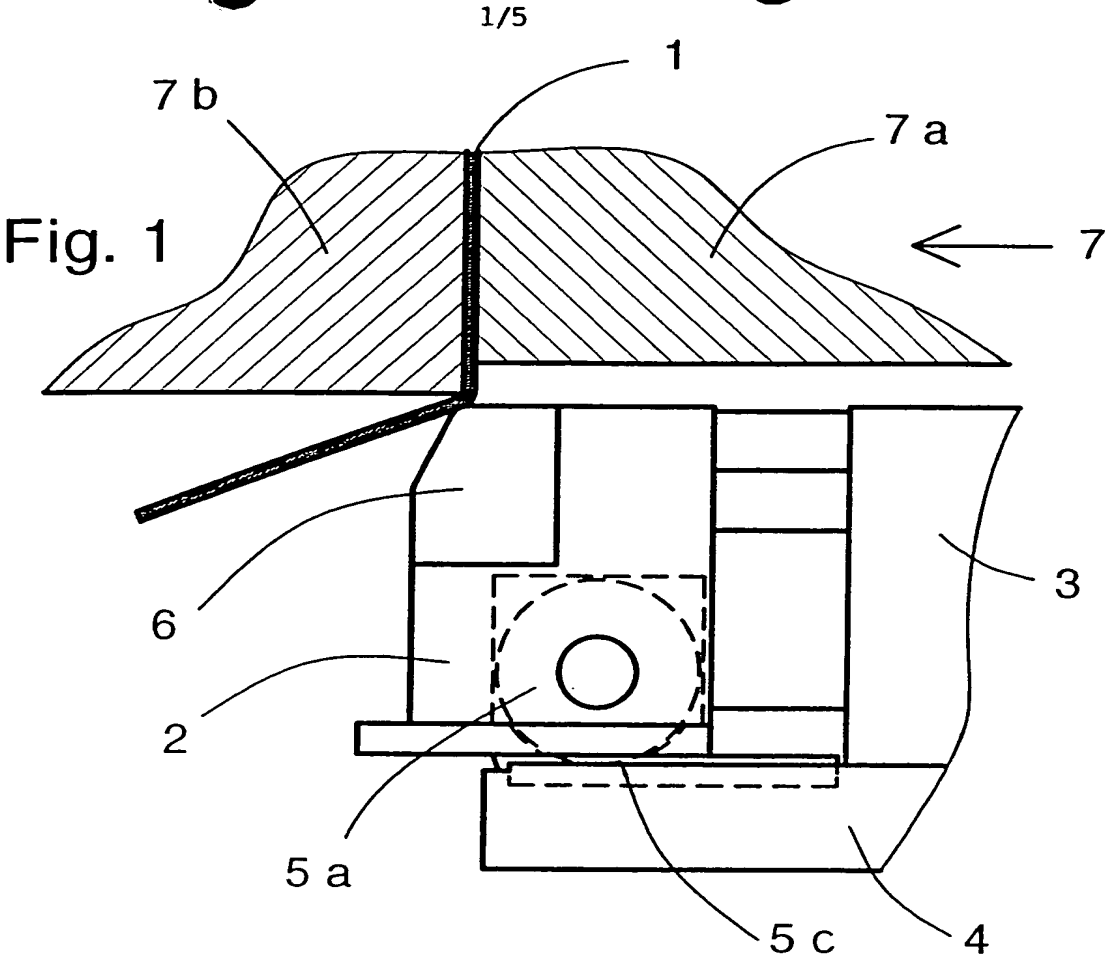
STRÖMSHOLMEN AB

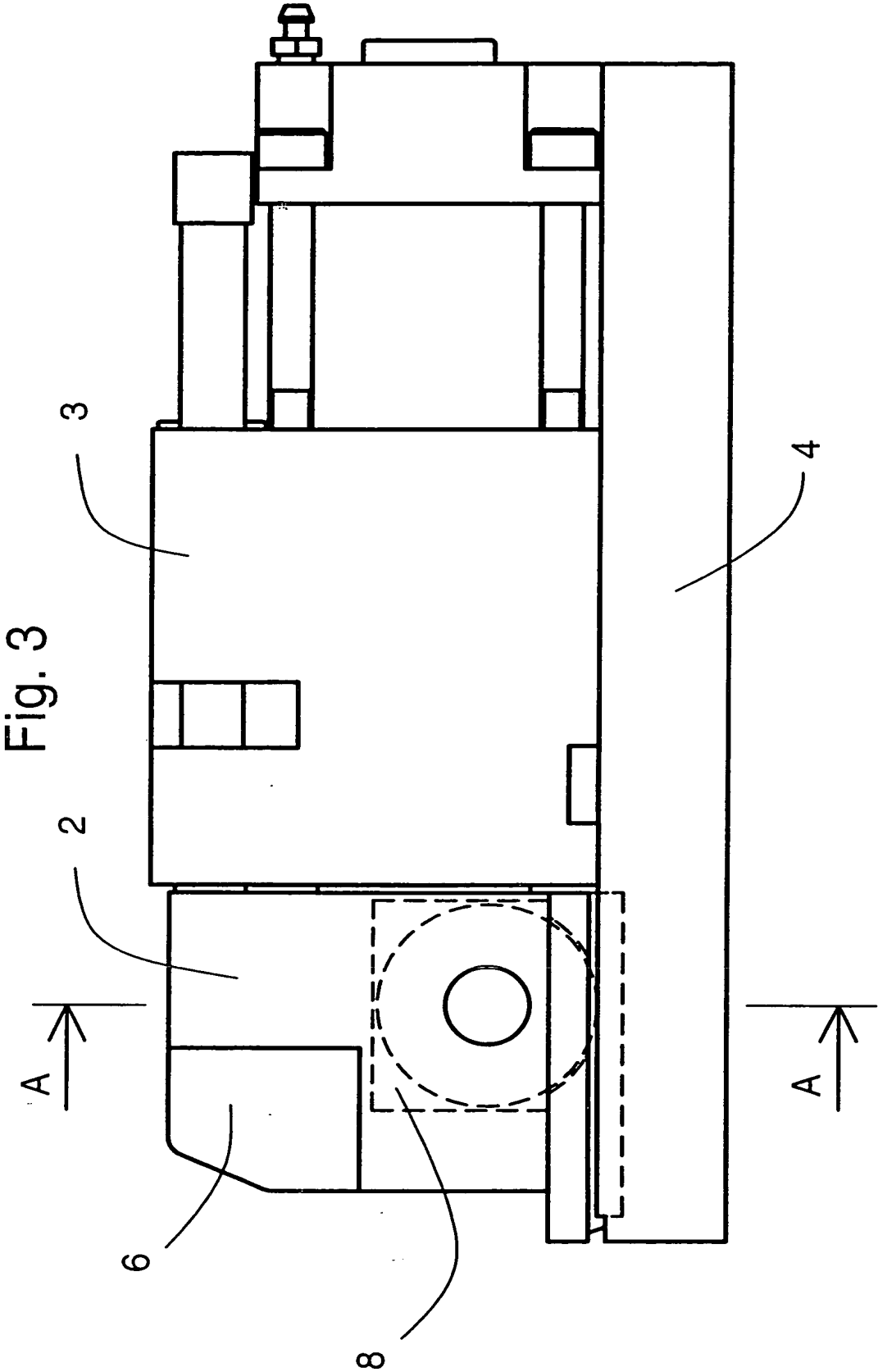
Gunnar Sand (President)

Per Nordvall

For receiving Office use only		2. Drawings: <input checked="" type="checkbox"/> received: <input type="checkbox"/> not received:
1. Date of actual receipt of the purported international application:	<u>09-08-2000</u>	
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:		
4. Date of timely receipt of the required corrections under PCT Article 11(2):		
5. International Searching Authority (if two or more are competent): <u>ISA/SE</u>	6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid.	

Date of receipt of the record copy by the International Bureau:	<u>30 AUG 2000</u>	<u>30.08.00</u>
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Fig. 4

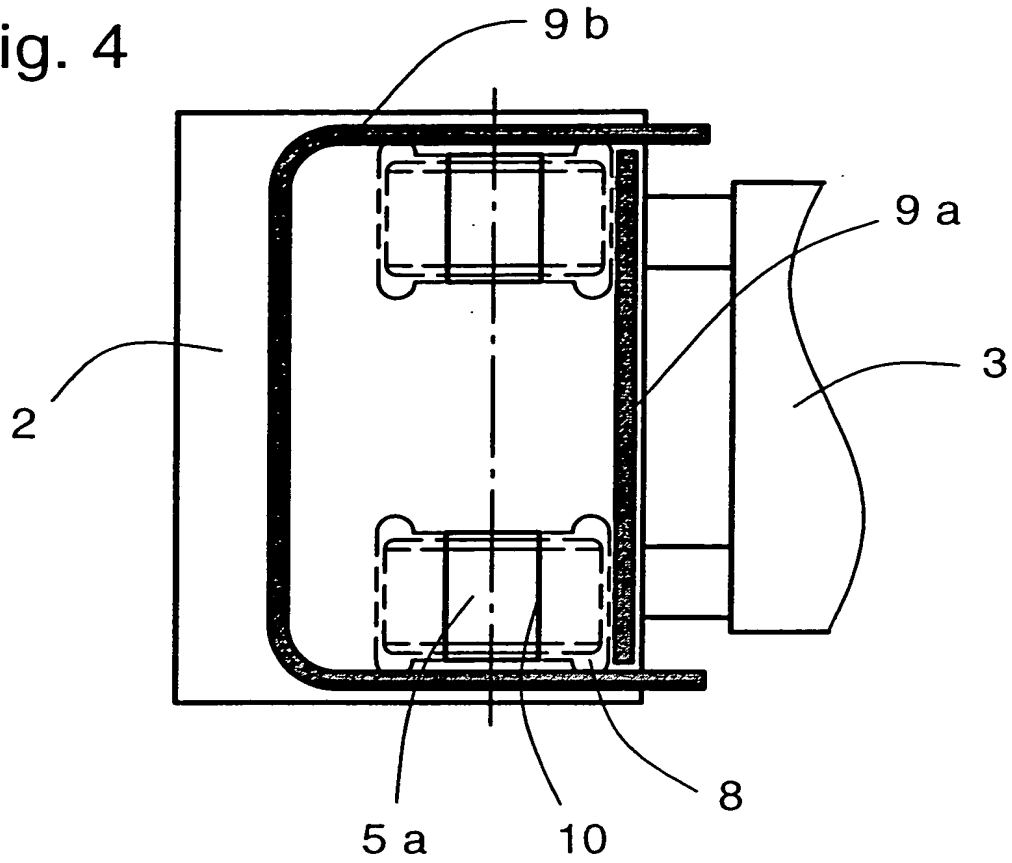


Fig. 5

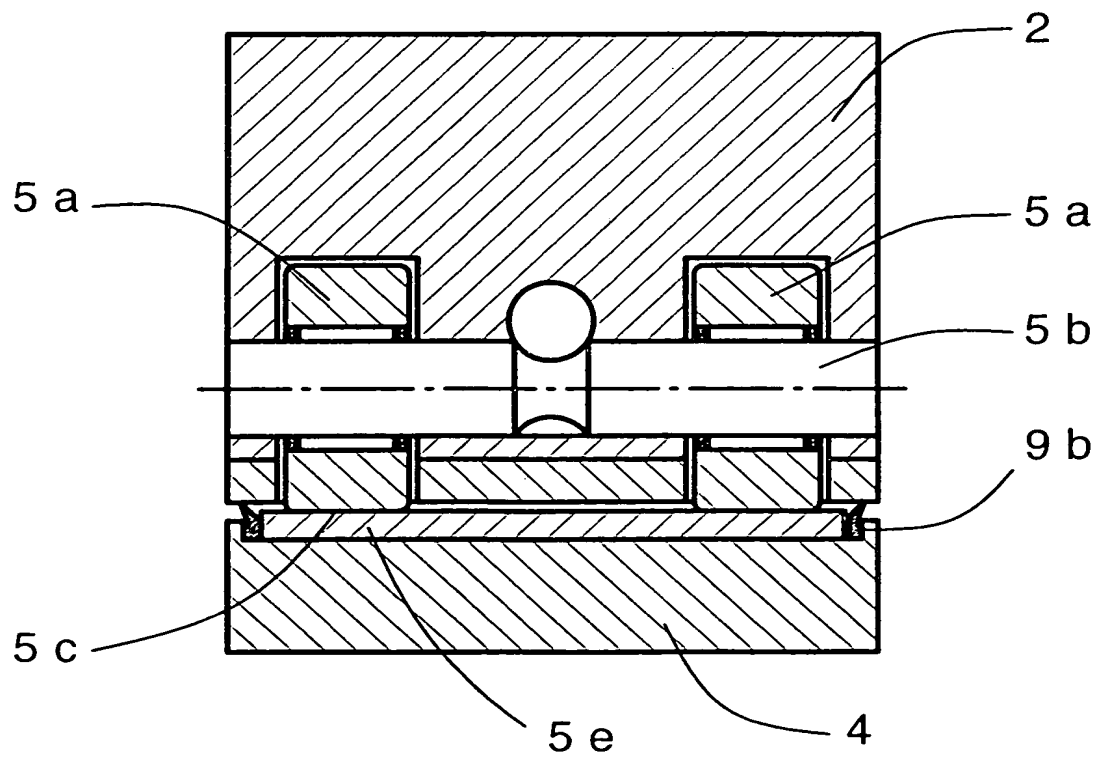


Fig. 6

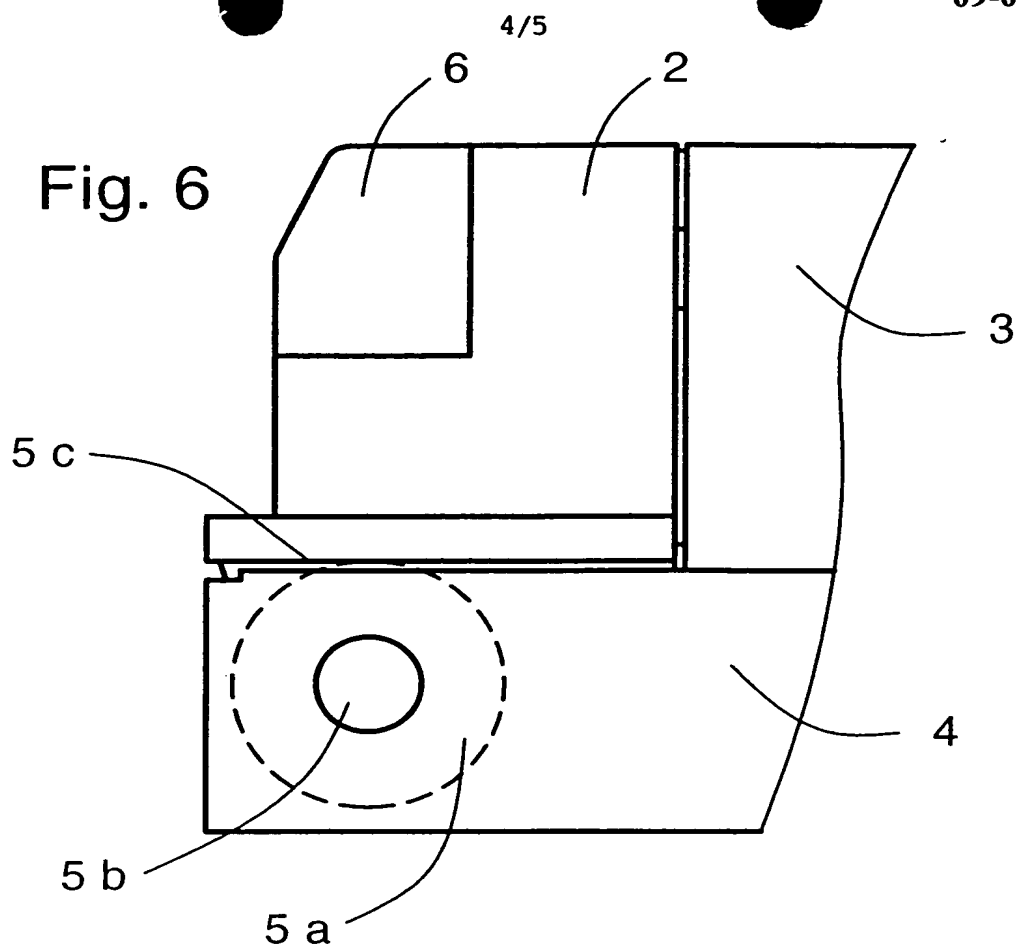


Fig. 7

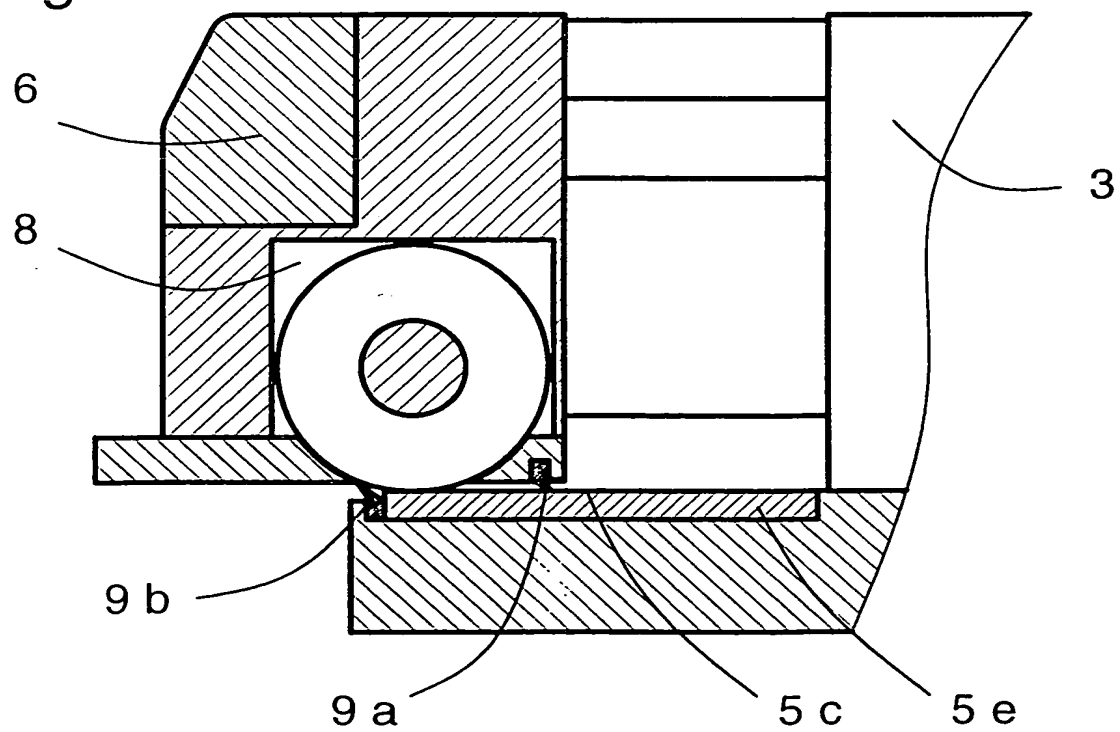


Fig. 8

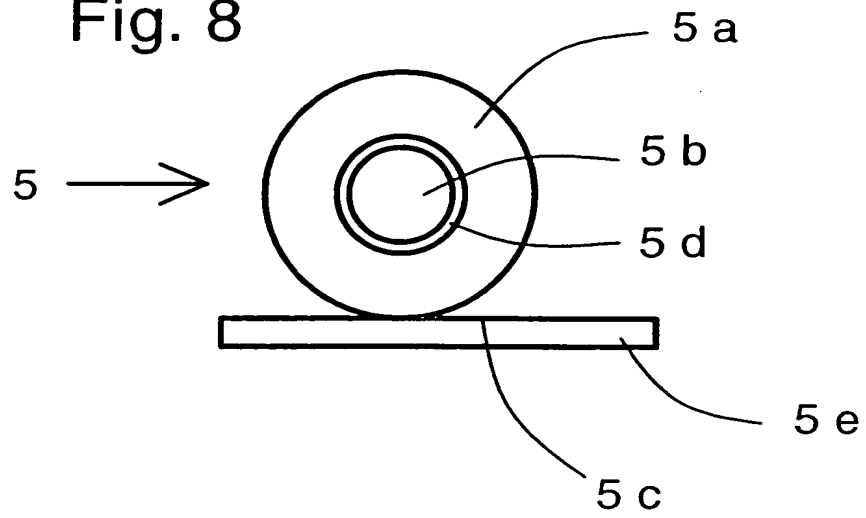
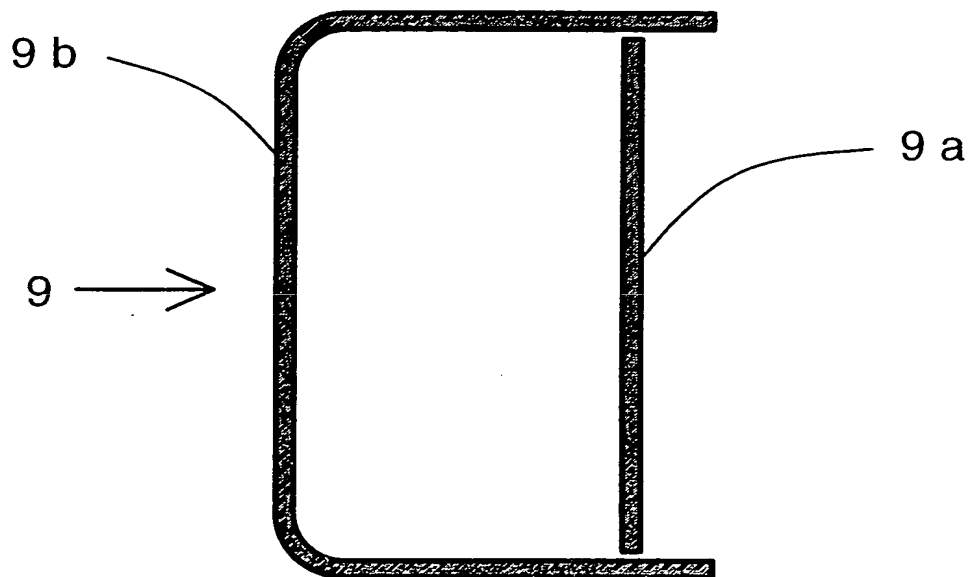


Fig. 9



Anordning vid ett plåtformningsverktyg

Föreliggande uppfinning avser en anordning vid ett plåtformningsverktyg enligt ingressen till patentkrav 1.

- 5 Det är sedan tidigare känt att, vid ett plåtformningsverktyg lagra en rörlig del med ett glidlager eller genom att låta rullar rulla mellan två plana ytor. Dessa lager har visat sig slitas kraftigt och förlora i repeternoggrannhet, företrädesvis i en riktning i vilken de belastas hårdast. Miljön som plåtformningsverktyget utsätts för är ofta smutsig, framförallt inom bilindustrin. En plåt som ska formas beläggs i många fall med ett smörjmedel med god vidhäftningsförmåga före plåtformningen och överblivet
- 10 smörjmedel rinner in på olämpliga ställen. Partiklar från plåtarbetet letar sig bl a in i lager, där de inte hör hemma. Smörjmedlet saknar ibland de egenskaper, som ett bra lagersmörjmedel har och försämrar därmed, vid uppblandning av de två smörjmedlen, en smörjfilm som finns i lagret. En dålig smörjfilm ökar risken för skador på lagret. Smörjmedlet fungerar även som bärare av partiklarna, vilka i sig ökar lager-
- 15 förslitningen och minskar repeternoggrannheten. Glidlagerkonstruktioner och konstruktioner med två plana ytor med rullar emellan, kräver en stor lageryta för att fungera väl vid en hög lagerbelastning. Storleken på ett plant lager bestäms även av en glidrörelses längd, vilket innebär att dessa konstruktioner är utrymmeskrävande.
- 20 EP-A1-370 582 visar olika typer av lagring exempelvis glidlagring, rullagring och kullelagring. Det visas dock ej hur en anordning skulle kunna åstadkommas, med vilken ovan beskrivna problem kan åtgärdas eller åtminstone minskas.

- 25 Det är ett ändamål med föreliggande uppfinning, att åstadkomma en anordning, vilken eliminerar eller åtminstone reducerar ovan beskrivna problem. Detta uppnås genom en anordning enligt kännetecknet i patentkrav 1.

- 30 Föredragna utföringsformer har dessutom i något eller några av de i underkraven angivna kännetecknen.

- Uppfinningen ska i det närmare förklaras med hjälp av bifogade ritning, vilken illustrerar exempel på utföringsformer av anordningen enligt föreliggande uppfinning.

- 35 Fig 1 visar schematiskt ett exempel på anordningen inrättad för flänsning, i kontakt med en fasthållen plåt.

Fig 2 visar ett exempel på anordningen inrättad för klippning, i kontakt med en fasthållen plåt.

5 Fig 3 visar schematiskt en uppfinningsenlig anordning med en drivkälla exemplifierad av en hydraulisk drivenhet.

Fig 4 beskriver ett exempel på ett tätningarrangemang omslutande en del av hjulen, i en vy betraktad underifrån av den rörliga delen i figur 3, samt den U-formade tätningen inlagd i figuren, för tydlighetens skull.

10 Fig 5 visar ett schematiskt snitt genom den rörliga delen i den föredragna utföringsformen, se snitt A-A i fig 3.

15 Fig 6 visar ett exempel på en alternativ utföringsform med hjulen placerade i en stativfast del.

Fig 7 visar ett exempel på en snittad schematisk vy av den första delen i ett framskjutet läge.

20 Fig 8 visar ett exempel på en uppfinningsenlig lagring.

Fig 9 visar ett exempel på ett tätningsarrangemang enligt uppfinningen.

25 Operationer, vilka den uppfinningsenliga anordningen är inrättade att utföra, exemplifieras i fig 1 och i fig 2. Andra operationer, vilka anordningen är inrättad att utföra och vilka ej visas på ritningen, är exempelvis håltagning, varvid anordningen speciellt lämpar sig för en håltagning där plåtens normal ej sammanfaller med anordningens rörelseriktning.

30 I figur 1 betecknar 1 en fasthållen plåt. En första del 2 är inrättad att under en framåtgående rörelse flänsa eller forma en del av plåten 1 medelst en plåtformningskraft erhållen från en drivenhet 3. Under den första delen i fig 1, finns en stativfast andra del 4, inrättad att stödja den första delen 2 via ett lager 5. Avståndet mellan delarna 2, 4 är litet, exempelvis 0.3-3.0 mm. Drivenheten, vilken i fig 3 exemplifieras av en
35 hydraulenhet, utgörs i alternativa fall av en kämenhet eller rullkämenhet (ej visade). Då en reaktionskraft från plåten 1 vinkelrätt rörelseriktningen uppträder på den första delen 2, tas den upp av lagringen 5 och den andra stativfasta delen 4, vilket lätt inses

ur fig 2. Lagringen 5 exemplifieras i fig 8 och innefattar en fast axel 5b med två roterbart monterade hjul 5a. Hjulen 5a är anordnade vid axelns 5b ändar. Ett rotationslager 5d är anordnat mellan varje hjul 5a och axeln 5b. En med 6 markerad del är inrättad att bytas ut, beroende av aktuell operation.

5

Hjulens 5a periferiyta är hårdgjord och står i kontakt med en löpyta 5c, längs vilken hjulen 5a är inrättade att löpa. Hjulens 5a radiella utsträckning mellan sina resp rotationslagringar 5d och periferiytor är tillräckligt stor för att smuts, smörjmedel och andra partiklar, som befinner sig på löpytorna 5c, endast svårligen kan nå hjulens 5a rotationslagringar 5d. En radiell utsträckning större än avståndet mellan delarna 2, 4, dvs ca 3 mm eller mer, är att föredra. Vid praktiska prov med två hjul och en simulerad plåtkraft på 44 kN, har en radiell utsträckning på 10 mm visat sig fungera tillfredsställande.

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Ett hus 8 omger varje hjul 5a. Varje hus 8 har en öppning 10, som vetter mot resp löpyta 5c. Endast en bråkdel av hjulen 5a skjuter ut genom resp öppning 10, så som visas i fig 7. Därigenom att hjulen 5a ansluter mot öppningen uppnås, att smuts, smörjmedel och andra partiklar svårligen kan nå rotationslagringarna 5d.

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Löpytorna 5c är två mot hjulen 5a och öppningen 10 vettande ytor på en härdad platta 5e, förbunden med och väsentligen inbäddad i den andra delen 4. De övre ytorna hos den andra delen 4 och löpytorna 5c ligger väsentligen i samma plan. Plattan 5e och därmed även löpytorna 5c, omgärdas av ett tätningsarrangemang 9, vilket försvårar för smuts, smörjmedel och andra partiklar att komma in mellan delarna 2, 4 och in mellan hjulen 5a och löpytorna 5c samt vidare till rotationslagringarna 5d. Arrangemanget 9 innefattar en U-formad tätning 9b och en I-formad tätning 9a. Den I-formade tätningens 9a ändar ansluter mot insidorna av den U-formade tätningens 9b skänklar och är inrättade att löpa däremellan. De båda tätningarna 9a, 9b bildar sålunda tillsammans med den första delens 2 undre yta och den andra delen 4 övre yta ett väsentligt slutet utrymme, vilket omsluter löpytorna 5c och den del av hjulen 5a som skjuter ut ur husen 8.

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Det är uppenbart att uppfinningen kan modifieras på många sätt inom ramen för uppfinningen. Sålunda är i en alternativ utföringsform axeln 5b roterbart infäst i den första delen 2 och hjulen 5a fast monterade på axeln 5b. I ytterligare en annan utföringsform innefattar lagringen 5 endast ett hjul 5a, vilket då är betydligt bredare, än ett av de två hjulen 5a. I ännu en alternativ utföringsform är fler hjul 5a anordnade på

samma axel 5b eller alternativt fler axlar 5b med två hjul 5a, eller i en kombination av dessa utföringsformer.

5 I en annan alternativ utföringsform är hjulen 5a placerade i den andra delen 4, se fig 6, varvid löpytorna 5c anordnas i den första delen 2.

I ytterligare en annan utföringsform omger endast ett hus 8 alla hjulen 5a.

Patentkrav

1. Anordning vid ett plåtformningsverktyg (7) innefattande, en första del (2) för utförande av en medelst en drivanordning (3) åstadkommen fram- och återgående rörelse relativt en andra stativfast del (4) samt en mellan delarna anordnad lagring (5), varav den första delen (2) har organ (6) för att åstadkomma en
5 formning eller en bearbetning av en fasthållen plåt (1), k ä n n e t e c k n a d av, att lagringen (5) innefattar åtminstone ett hjul (5a) på en axel (5b) anordnad på en av delarna (2) samt en på den återstående delen (4) mot hjulet (5a) vänd, den första delens (2) rörelse definierande löpyta (5c) för nämnda hjul (5a).
- 10 2. Anordning enligt patentkrav 1, k ä n n e t e c k n a d av, att det på axeln (5b) finns åtminstone två hjul (5a) anordnade på ett inbördes avstånd.
3. Anordning enligt något av föregående patentkrav, k ä n n e t e c k n a d av, att varje hjul (5a) omges av ett hus (8), ur vilket genom en mot löpytorna (5c)
15 vettande öppning (10) endast en bråkdel av resp hjul (5a) skjuter ut.
4. Anordning enligt något av föregående patentkrav, k ä n n e t e c k n a d av, att öppningen (10) väsentligen ansluter mot varje hjul (5a).
- 20 5. Anordning enligt något av föregående patentkrav, k ä n n e t e c k n a d av, att axeln (5b) är fixerad vid den med formnings- eller bearbetningsorgan (6) utbildade delen (2) och att hjulen (5a) är roterbart lagrade på axeln (5b).
6. Anordning enligt något av patentkraven 1 - 4, k ä n n e t e c k n a d av, att
25 axeln (5b) är fixerad vid den stativfasta delen (4) och att hjulen (5a) är roterbart lagrade på axeln (5b).
7. Anordning enligt något av föregående patentkrav, k ä n n e t e c k n a d av, att ett tätningsarrangemang (9) inrättat att täta mellan den första (2) och den andra
30 delen (4) samt väsentligen omsluta ovan nämnda bråkdel av varje hjul (5a).
8. Anordning enligt något av föregående patentkrav, k ä n n e t e c k n a d av, att arrangemanget (9) innefattar en U-formad tätning (9b) anordnad på den andra delen (4) och en, utsträckande sig mellan den U-formade tätningens (9b)

skänklar, I-formad tätning (9a), anordnad på den första delen (2).

9. Anordning enligt något av föregående patentkrav, k ä n n e t e c k n a d av, att avståndet mellan delarna (2, 4) är mindre än plåtens (1) tjocklek.

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10. Anordning enligt något av föregående patentkrav, k ä n n e t e c k n a d av, att det radiella avståndet mellan varje hjuls (5a) periferiyta och dess rotationslagring (5d) är större än avståndet mellan delarna (2, 4).

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Sammandrag

5 Anordning vid ett plåtformningsverktyg (7) innefattande, en första del (2) för utförande av en fram- och återgående rörelse relativt en andra stativfast del (4). Den första delen (2) har ett organ (6) för att, medelst en drivanordning (3) åstadkomma en formning eller en bearbetning av en fasthållen plåt (1). En lagring finns mellan delarna (2, 4), vilken åtminstone har ett hjul (5a) på en axel anordnad på en av delarna (2). På den återstående delen (4) finns en mot hjulet (5a) vänd, den första delens (2) rörelse definierande löpyta (5c) för nämnda hjul (5a).

(Fig 1)

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(71) Applicant (for all designated States except US):
STRÖMSHOLMEN AB [SE/SE]; P.O. Box 216, S-573
23 Tranås (SE).

(72) Inventor; and

(75) Inventor/Applicant (for US only): NORDVALL, Per
[SE/SE]; Hagadalsgatan 57, S-573 40 Tranås (SE).

(74) Agents: WILLQUIST, Bo et al.; Willquist & Partners
Patentbyrå AB, Platensgatan 9C, S-582 20 Linköping (SE).

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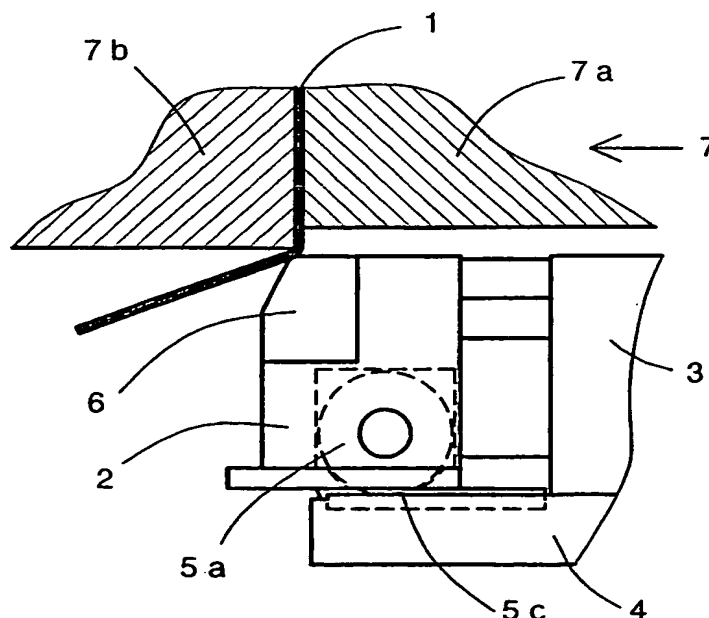
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Published:

— With international search report.

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: DEVICE AT A PLATE FORMING TOOL



(57) Abstract: Arrangement in a sheet-metal forming tool (7) comprising a first part (2) for performing a reciprocating movement in relation to a second part (4) fixed to a stand. The first part (2) has an element (6) for forming or machining a held sheet (1) by means of a drive arrangement (3). There is a bearing between the parts (2, 4) which has at least one wheel (5a) on a shaft arranged on one of the parts (2). On the remaining part (4) there is a running surface (5c) for the said wheel (5a), the said surface facing the wheel (5a) and defining the movement of the first part (2).

Device at a plate forming tool

The present invention relates to an arrangement in a sheet-metal forming tool according to the pre-characterising clause of claim 1.

5 Supporting a moveable part in a sheet-metal forming tool by means of a plain bearing or by getting rollers to roll between two plane surfaces was previously known. The said bearings have proved prone to heavy wear and to loss of repeat accuracy, especially in a direction in which they are subjected to the heaviest loading. The environment to which the sheet-metal forming tool is exposed is often dirty, especially in the motor industry. A sheet that is to be formed is in many cases coated with a lubricant with good adhesion
10 properties prior to sheet metal forming and residual lubricant runs into inappropriate places. Particles from the sheet-metal working find their way, among other things, into bearings, where they do not belong. The lubricant sometimes lacks the characteristics of a good bearing lubricant and thereby degrades a film of lubricant present in the bearing when the two lubricants become mixed. A poor lubricating film increases the risk of
15 damage to the bearing. The lubricant also acts as a carrier of the particles that inherently increase the bearing wear and reduce the repeat accuracy. Plain bearing constructions and constructions with two plane surfaces with rollers between them require a large bearing surface in order to function well under high bearing loads. The size of a plain bearing is also determined by the length of a slide movement, which means that the said
20 constructions take up a lot of space.

EP-A1-370 582 shows various types of bearing, for example plain bearing, roller bearing and ball and socket bearing. However, it is not shown how an arrangement capable of solving or at least reducing the problem described above might be produced.
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An object of the present invention is to produce an arrangement, which will eliminate or at least reduce the problem described above. This is achieved by an arrangement according to the characterising part of claim 1.

30 Preferred embodiments have, in addition, any or some of the characteristics specified in the subordinate claims.

The invention will be explained in more detail with the aid of the drawing attached, which illustrates examples of embodiments of the arrangement according to the present
35 invention.

- Fig. 1 shows a diagram of an example of the arrangement designed for flanging, in contact with a held sheet.
- Fig. 2 shows an example of the arrangement designed for cutting, in contact with a held sheet.
- Fig. 3 shows a diagram of an arrangement according to the invention with a drive source exemplified by a hydraulic drive unit.
- Fig. 4 describes an example of a sealing arrangement enclosing a part of the wheels in a view looking at the moveable part in figure 3 from below, together with the U-shaped seal inset in the figure, for the sake of clarity.
- Fig. 5 shows a diagrammatic section through the moveable part in the preferred embodiment, see section A-A in figure 3.
- Fig. 6 shows an example of an alternative embodiment with the wheels located in a part fixed to a stand.
- Fig. 7 shows an example of a cut-away diagrammatic view of the first part in an advanced position.
- Fig. 8 shows an example of a bearing according to the invention.
- Fig. 9 shows an example of a sealing arrangement according to the invention.

Examples of operations, which the arrangement according to the invention is designed to perform, are shown in figure 1 and figure 2. Other operations, which the arrangement is designed to perform and which are not shown in the drawing, include hole-making, for example, the arrangement being especially suited to hole-making where the perpendicular line of the sheet metal does not coincide with the direction of movement of the arrangement.

In figure 1, 1 denotes a held sheet. A first part 2 is designed, during an advancing movement, to flange or form a part of the sheet 1 by means of a sheet-metal forming force obtained from a drive unit 3. Beneath the first part in figure 1 there is a second part 4 fixed to a stand and designed to support the first part 2 by way of a bearing 5. The distance between the parts 2, 4 is small, for example 0.3-3.0 mm. The drive unit, which

in figure 3 is exemplified by a hydraulic unit, may alternatively take the form of a cam unit or roller cam unit (not shown). When a reaction force from the sheet 1, perpendicular to the direction of movement, occurs on the first part 2, this is absorbed by the bearing 5 and the second part 4 fixed to a stand, which second part can be clearly
5 seen from figure 2. An example of the bearing 5 is shown in figure 8 and comprises a fixed shaft 5b with two rotatably mounted wheels 5a. The wheels 5a are arranged at the ends of the shaft 5b. A pivot bearing 5d is arranged between each wheel 5a and the shaft 5b. A part indicated by 6 is designed to be interchangeable, depending on the current operation.

10 The peripheral surface of the wheels 5a is hardened and is in contact with a running surface 5c, along which the wheels 5a are designed to run. The radial extent of the wheels 5a between their respective pivot bearings 5d and peripheral surfaces is large enough to ensure that dirt, lubricant and other particles present on the running surfaces
15 5c can reach the pivot bearings 5d of the wheels 5a only with difficulty. A radial extent greater than the distance between the parts 2, 4, that is approximately 3 mm or more, is to be preferred. In practical trials with two wheels and a simulated sheet metal force of 44 kN a radial extent of 10 mm has proved to work satisfactorily.

20 A housing 8 surrounds each wheel 5a. Each housing 8 has an opening 10, which faces each running surface 5c. Only a fraction of the wheels 5a protrude out through each opening 10, as is shown in figure 7. The fact that the wheels 5a lie close up to the opening means that dirt, lubricant and other particles cannot easily reach the pivot bearings 5d.

25 The running surfaces 5c are two surfaces of a hardened sheet metal facing the wheels 5a and the opening 10 and connected to and substantially embedded in the second part 4. The upper surfaces of the second part 4 and the running surfaces 5c lie substantially in the same plane. The sheet 5e and hence also the running surfaces 5c are enclosed by a
30 sealing arrangement 9, which makes it more difficult for dirt, lubricant and other particles to get in between the parts 2, 4 and in between the wheels 5a and the running surfaces 5c and further to the pivot bearings 5d. The arrangement 9 comprises a U-shaped seal 9b and an I-shaped seal 9a. The ends of the I-shaped seal 9a lie close up to the insides of the legs of the U-shaped seal 9b and are designed to run between them.
35 Together with the lower surface of the first part 2 and the upper surface of the second part 4, the two seals 9a, 9b thus form a substantially enclosed space, which surrounds the running surfaces 5c and that part of the wheels 5a that protrudes out of the housing 8.

It will be obvious that the invention can be modified in many ways within the scope of the invention. Thus in an alternative embodiment the shaft 5b is rotatably ~~fixed in the~~ first part 2 and the wheels 5a are firmly mounted on the shaft 5b. In a further embodiment the bearing 5 comprises only one wheel 5a, which is then significantly
5 wider than either of the two wheels 5a. In yet another alternative embodiment a plurality of wheels 5a is arranged on the same shaft 5b or alternatively a plurality of shafts 5b with two wheels 5a, or in a combination of the said embodiments.

10 In another alternative embodiment the wheels 5a are located in the second part 4, see figure 6, the running surfaces 5c being arranged in the first part 2.

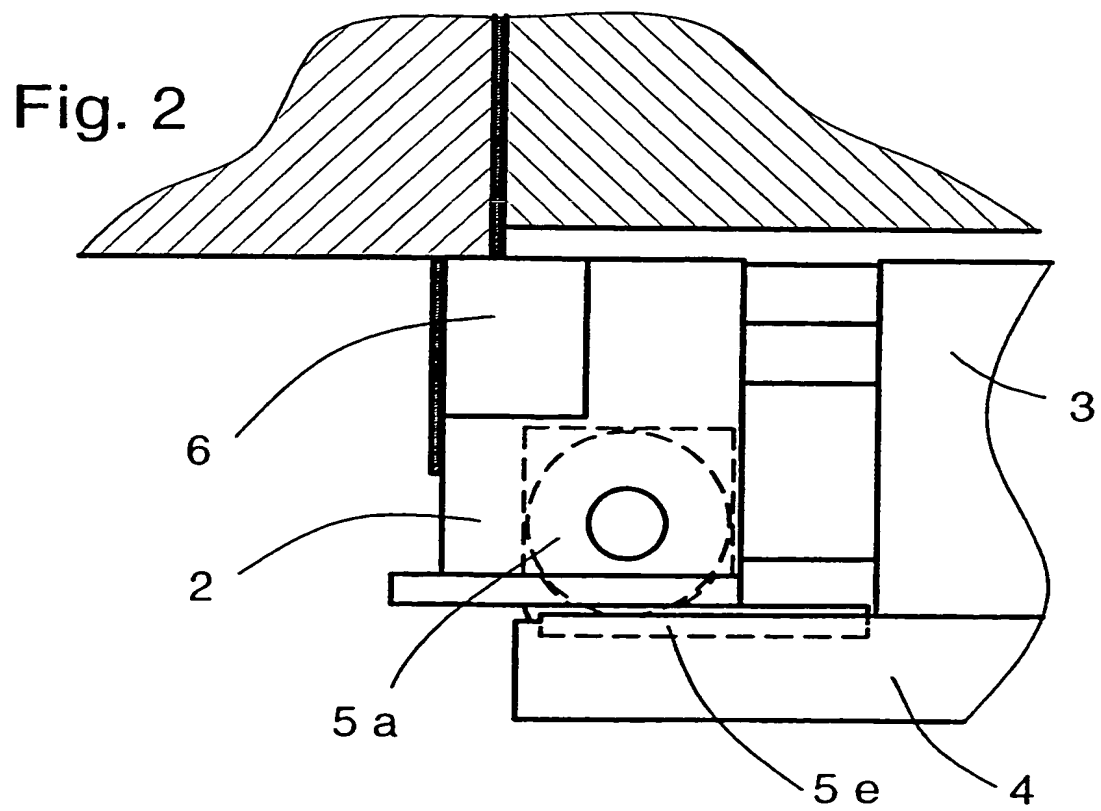
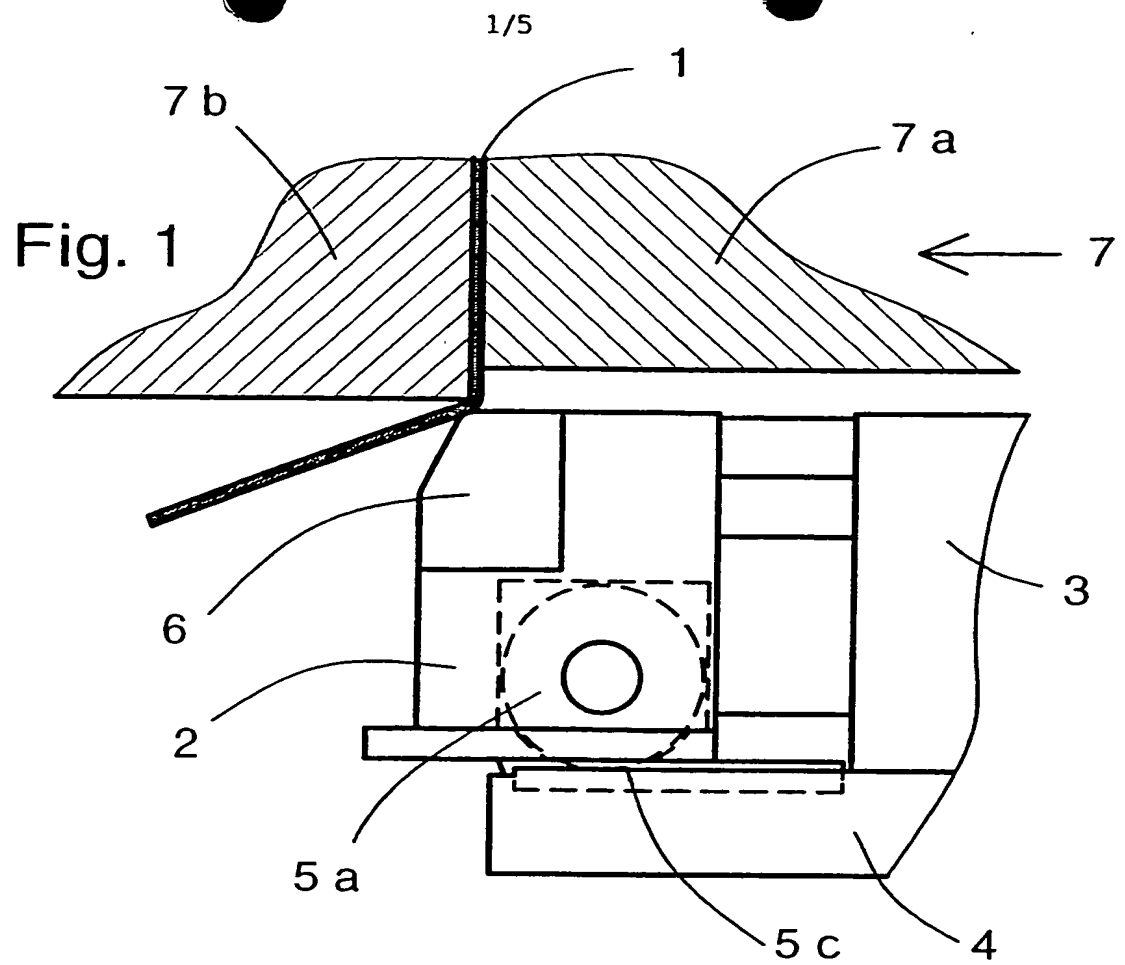
In yet another embodiment just one housing 8 encloses all the wheels 5a.

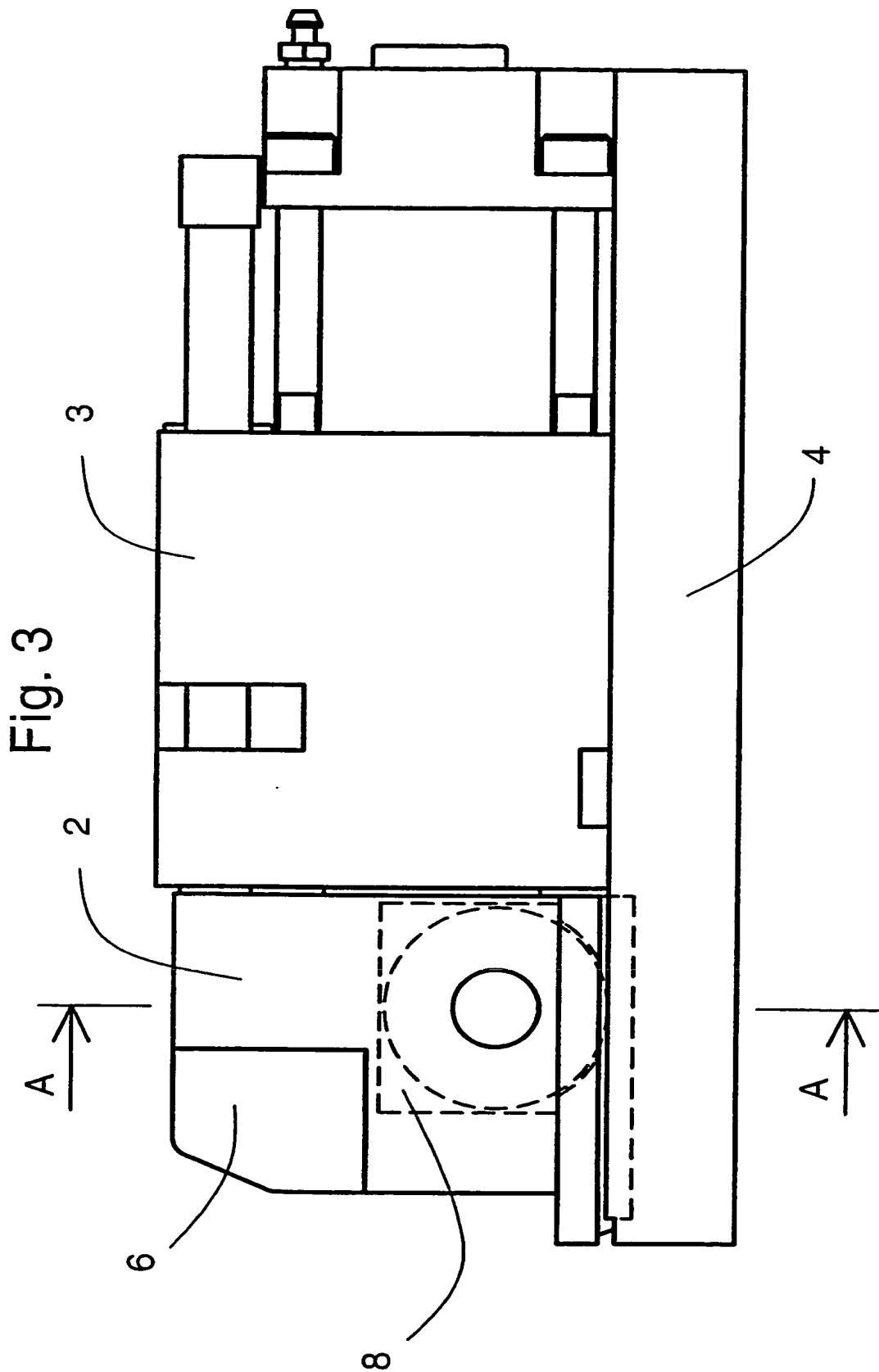
Claims

1. Arrangement in a sheet-metal forming tool (7) comprising a first part (2) for performing a reciprocating movement, produced by means of a drive arrangement (3), in relation to a second part (4) fixed to a stand, and a bearing (5) arranged between the parts, of which the first part (2) has elements (6) for forming or machining a held sheet (1) **characterised in that** the bearing (5) comprises at least one wheel (5a) on a shaft (5b) arranged on one of the parts (2) and a running surface (5c) for the said wheel (5a) on the remaining part (4), the said surface facing the wheel (5a) and defining the movement of the first part (2).
2. Arrangement according to claim 1, **characterised in that** there are at least two wheels (5a) on the shaft (5b) arranged at a distance from one another.
3. Arrangement according to either of the preceding claims, **characterised in that** each wheel (5a) is enclosed by a housing (8), from which only a fraction of each wheel (5a) protrudes through an opening (10) facing the running surfaces (5c).
4. Arrangement according to any of the preceding claims, **characterised in that** the opening (10) lies substantially close up to each wheel (5a).
5. Arrangement according to any of the preceding claims, **characterised in that** the shaft (5b) is fixed to the part (2) designed with the forming or machining element (6), and that the wheels (5a) are rotatably supported on the shaft (5b).
6. Arrangement according to any of claims 1-4, **characterised in that** the shaft (5b) is fixed to the part (4) fixed to a stand, and that the wheels (5a) are rotatably supported on the shaft (5b).
7. Arrangement according to any of the preceding claims, **characterised in that** a sealing arrangement (9) is designed to form a seal between the first part (2) and the second part (4) and to substantially enclose the above-mentioned fraction of each wheel (5a).
8. Arrangement according to any of the preceding claims, **characterised in that** the arrangement (9) comprises a U-shaped seal (9b) arranged on the second part (4) and an I-shaped seal (9a), arranged on the first part (2) and extending between the

legs of the U-shaped seal (9b).

- 5
9. Arrangement according to any of the preceding claims, **characterised in that** the distance between the parts (2, 4) is less than the thickness of the sheet (1).
 10. Arrangement according to any of the preceding claims, **characterised in that** the radial distance between the peripheral surface of each wheel (5a) and its pivot bearing (5d) is greater than the distance between the parts (2, 4).





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Fig. 4

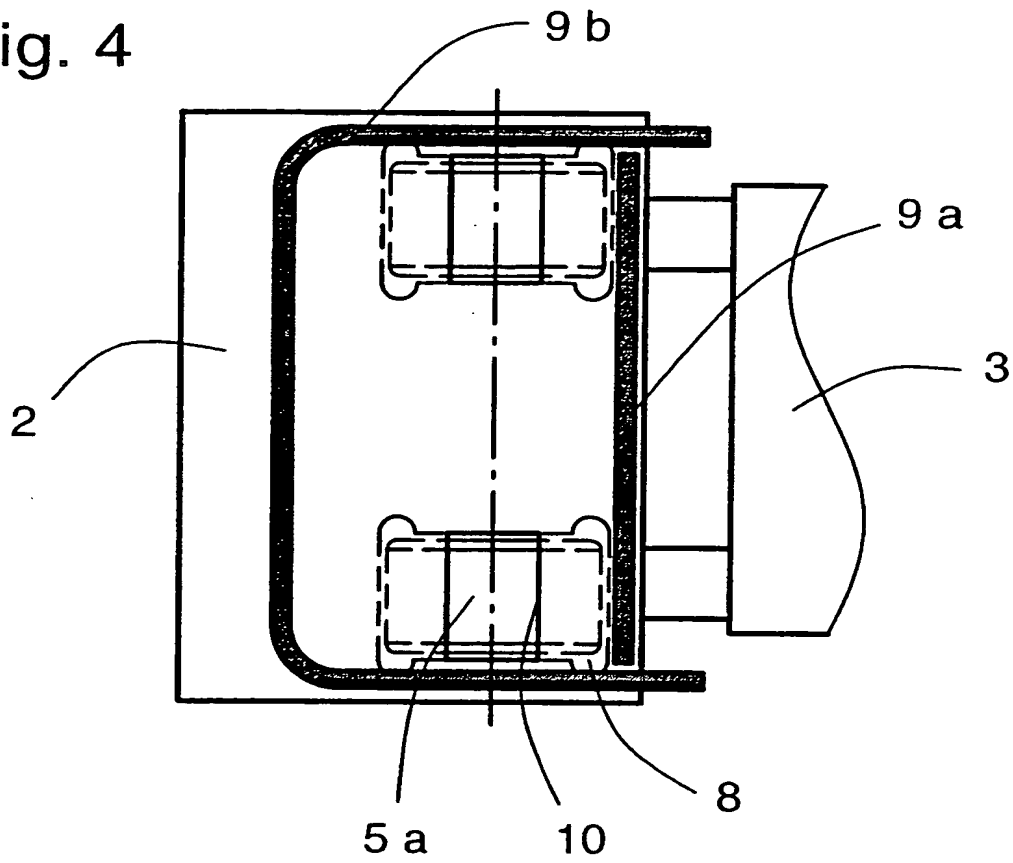
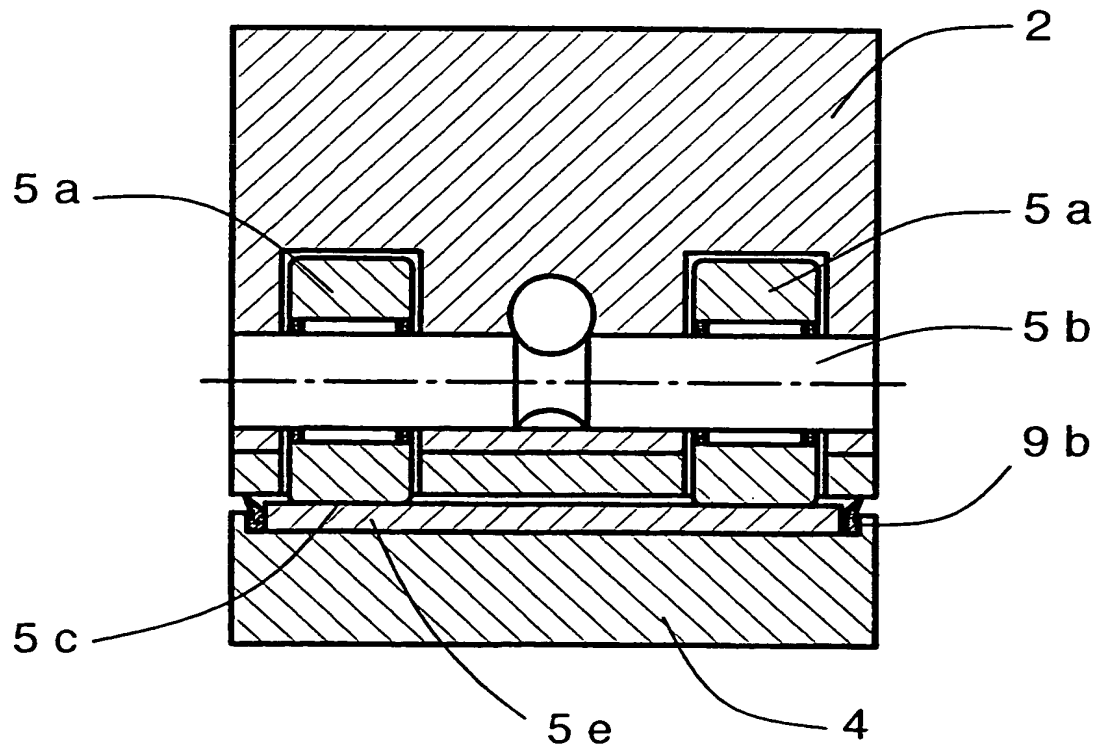


Fig. 5



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Fig. 6

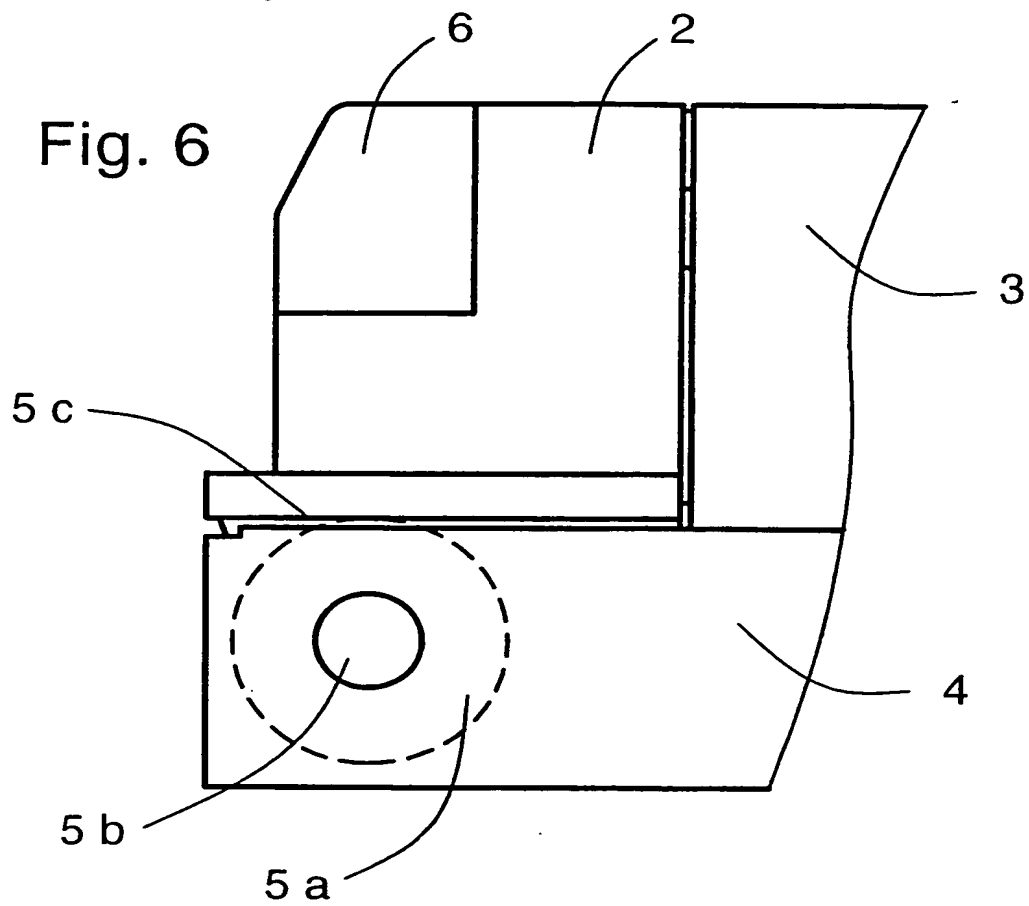


Fig. 7

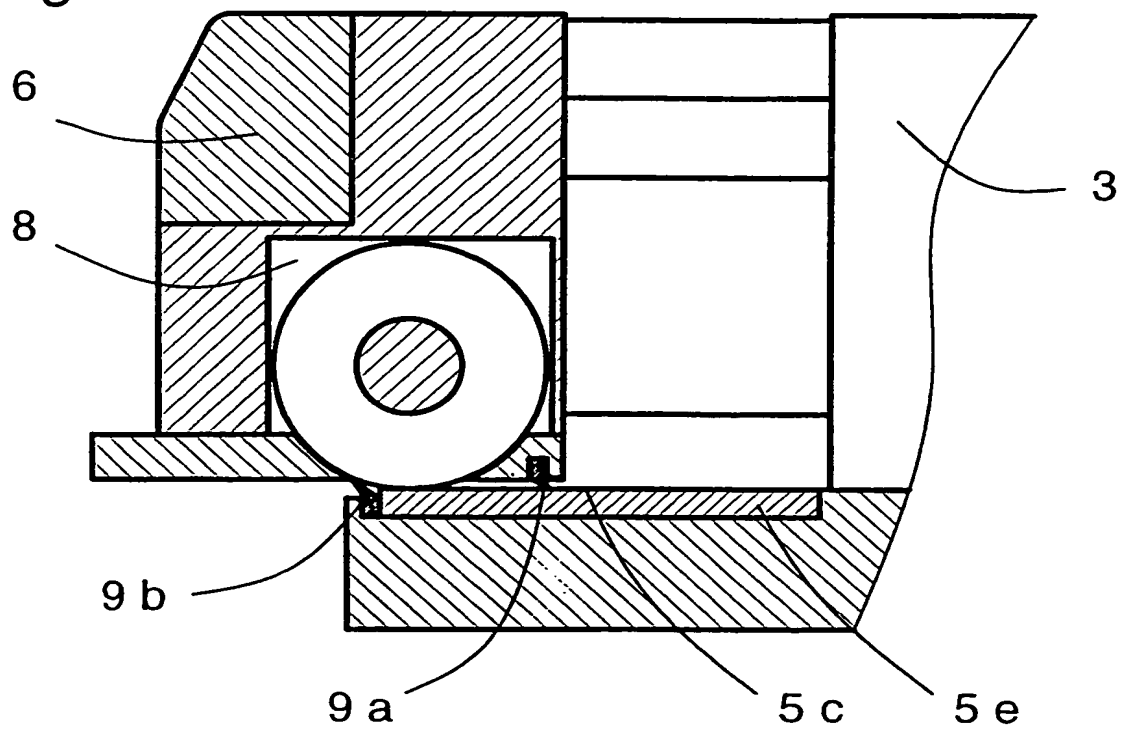


Fig. 8

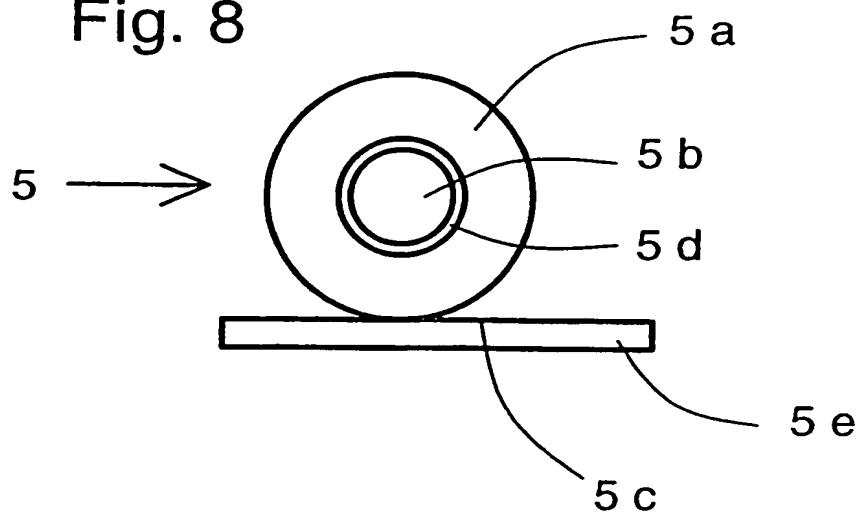
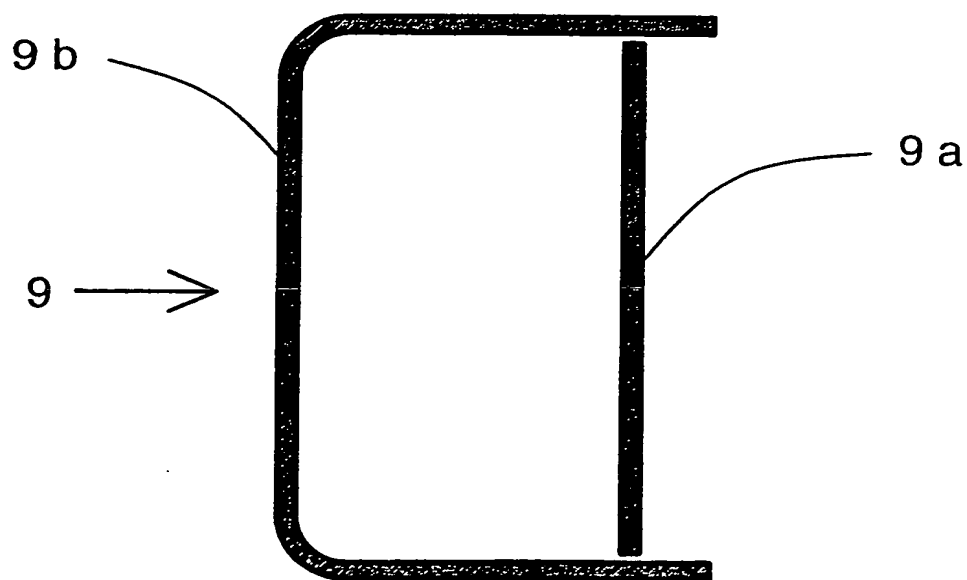


Fig. 9



INTERNATIONAL SEARCH REPORT

International application No.

P E 00/01559

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B21D 19/08 // B21D 5/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B21D, B26F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4565084 A (JONSSON), 21 January 1986 (21.01.86), figure 3, abstract --	1-10
A	US 5341669 A (KATZ), 30 August 1994 (30.08.94), figures 1,2, abstract --	1-10
A	US 4181002 A (ECKHOLD ET AL), 1 January 1980 (01.01.80), figures 1,4,5, abstract --	1-10
A	FR 2331392 A1 (CHAUDRONNERIE DE CHARENTON S.A.), 10 June 1977 (10.06.77), figures 1-3 -- -----	1-10

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Box 5055, S-102 42 STOCKHOLM

Facsimile No. +46 8 666 02 86

Authorized officer

Katarina Ekman / JA A

Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT
Information on patent family members

02/11/00

International application No.
PCT/SE 00/01559

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